NASA TECH BRIEF

Detection System Ensures Positive Alarm Activation in Digital Message Loss
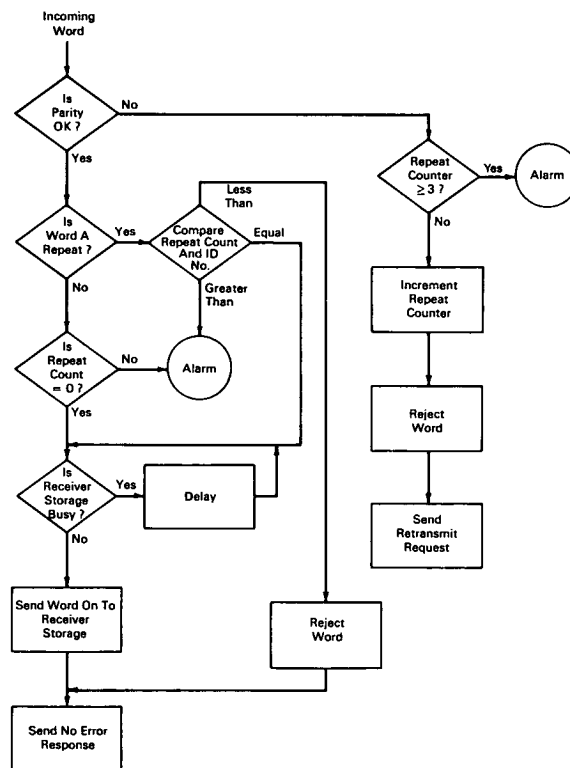
The problem:

In many data transmission systems which use the block- or word-segmented data group, the transmitting terminal of the system is required to store the message long enough for it to be examined for error by the receiving terminal. After the examination, the receiving terminal transmits one of two possible messages to the transmitting terminal, instructing it either to retransmit the message (if an error was detected), or to erase it from storage (if there was no error), and permit the next message to be transmitted. As a result of errors in the transmission from receiver to transmitter, request for error retransmission could be improperly decoded as an erase request. This would result in the loss of the message from both the transmitting and receiving stations, and this loss of message might go undetected, despite the elaborate message bookkeeping schemes.

The solution:

A proposed LOWDS (Lost Word Detection System) that provides additional special identification for each

message. Each transmitted message contains a *Message Identity* portion, which identifies the message as either an original (not previously transmitted) message, or as an n-times retransmitted message. The receiver can then detect any case where a request for retransmission was not fulfilled, and activate an alarm, indicating digital message loss as a result of an undetected error in a response message from the receiver to the transmitter.

How it's done:

At the receiving terminal the error checking circuits examine the incoming message from the transmitting terminal. If the message contains an error, a retransmit request is generated and sent back to the transmitting terminal. At the same time the receiving terminal notes the fact that following a given period the message must be retransmitted. This retransmission must have a message identity designating it as the first requested retransmission. If a message with any other message identification is received, it indicates that the original message has been lost and activates an alarm.

In detail, the incoming word is first checked for parity. If the parity check is good the word is examined to see if it is a repeat. If the ID serial number is "00", then the word is a new one and the repeat counter (which keeps track of the number of repeat requests sent by the receiving terminal) is checked to see if a repeat was requested. If a repeat was requested then a word has been lost and the alarm is activated. If the repeat counter also reads "00", then the word is a new word which is accepted by the receiver, and a signal is sent to the transmitting terminal, acknowledging an error free reception. The transmitter is then free to transmit the next word and erase the previous word from its storage.

If parity is good and the word is a repeat, then the repeat counter is compared to the ID serial number of the word (which shows which order of repeat it is). If the number in the repeat counter is greater than the ID serial number, then a word has been lost and the alarm is activated. If the number in the repeat counter is less than the ID serial number, a repeat word was sent when a new word was requested. The word is rejected and a no-error-detected response is sent to the transmitting station.

If the number in the repeat counter is equal to the ID serial number, then the word received is the proper order of repeat and is accepted by the receiver, a no-error response is sent to the transmitting terminal, and the repeat counter is cleared.

Notes:

1. This system is part of a digital data link system providing computer-to-computer data transfer where an undetected loss of any message cannot be tolerated.

2. The *Message Identity* portion of the message and the two responses from the receiver to the transmitter (a no-error-detected response or a request for retransmission) may be protected by standard error correction codes to further decrease the probability of an undetected communication error.

3. If the equipment to which the receiver is attached is too busy to accept an error free message, the receiver can then call for a retransmission of the message. This action inserts a delay in the system to permit the busy state to terminate. This feature requires very little additional equipment since it makes use of the standard LOWDS retransmission facility, and eliminates the requirement for a one-word storage buffer.

4. Inquiries concerining this innovation may be directed to:

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Reference: B66-10287

Patent status:

No patent action is contemplated by NASA.

Source: Paul Bokros, Albert Burstein,
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